CLAIMS

1. A device for reinitializing to a state $|0\rangle$ a quantum bit device having two states $|0\rangle$ and $|1\rangle$ associated with respective energy levels E_0 and E_1 where $E_0 < E_1$, which device is characterized in that it comprises first means for generating a temporary increase in the probability of the quantum bit device relaxing from the state $|1\rangle$ to the state $|0\rangle$ and second means for absorbing the transition energy $\Delta E_{01} = E_1 - E_0$ ceded by the quantum bit device when it relaxes from the state $|1\rangle$ to the state $|0\rangle$.

2. A quantum bit device reinitializing device according to claim 1, characterized in that the second means are in the immediate energy environment of the quantum bit device and have at least one absorption peak whose value ΔE_{env} is:

- sufficiently far away from the transition energy $\Delta E_{01} = E_1 - E_0$ of the quantum bit device to eliminate or to render negligible all interaction between the quantum bit device and said second means, but
- sufficiently close to said transition energy for the quantum bit device to be able to operate under conditions such that the transition energy $\Delta E'_{01}$ becomes equal to or close to the value ΔE_{env} of the absorption peak, so that a strong coupling of energy between the quantum bit device and said second means can exist temporarily,

and the first means are adapted to modify the transition energy $\Delta E_{01} = E_1 - E_0$ of the quantum bit device during reinitialization to said value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

3. A quantum bit device reinitializing device according to claim 2, characterized in that the second means have at least one absorption peak of value ΔE_{env} having a particular degree of freedom able to absorb the

transition energy $\Delta E_{01} = E_1 - E_0$ of the quantum bit device when the latter is changed to the value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

4. A quantum bit device reinitializing device according to claim 2, characterized in that the second means having an absorption peak of value ΔE_{env} have a plurality of degrees of freedom with a high quantum spectral density at the transition frequency $\nu_{01} = \Delta E_{01}/h$ of the quantum bit device, where h is Planck's constant.

5. A quantum bit device reinitializing device according to any one of claims 2 to 4, characterized in that the first means comprise means for generating specific reinitialization set points that are applied to the usual means for adjusting the quantum bit device to change the transition energy ΔE_{01} temporarily to the value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

6. A quantum bit device reinitializing device according to claim 5, characterized in that the specific reinitialization set points have a value outside the ranges used when the quantum bit device is allowed to evolve coherently.

7. A quantum bit device reinitializing device according to any one of claims 2 to 4, characterized in that the first means comprise specific means for adjusting operating parameters of the quantum bit device that act directly on the transition energy of the quantum bit device to change the transition energy ΔE_{01} temporarily to a value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak independently of the setting of the operating parameters of the quantum bit device chosen to cause it to evolve coherently.

8. A quantum bit device reinitializing device according to any one of claims 1 to 7, characterized in that the quantum bit device comprises a physical medium that exhibits quantum behavior and consists of a superconductor integrated electronic device having Josephson junctions (101, 102), a Cooper-pair box (110), and a read Josephson junction (105) activated by a current pulse.

9. A quantum bit device reinitializing device according to any one of claims 5 and 8, characterized in that the first means comprise means for generating specific reinitialization set points in the form of a current pulse that are applied to the read Josephson junction (105) and the amplitude of the current pulse is chosen to maximize the relaxation of the quantum bit device.

10. A quantum bit device reinitializing device according to claim 9, characterized in that the amplitude of the current pulse is outside the range used during a read operation.

11. A quantum bit device reinitializing device according to claims 5 and 8, characterized in that it comprises magnetic adjustment means acting on the phase δ of the quantum bit device that include a magnetic coil and a current pulse generator and the first means comprise means for generating specific reinitialization set points in the form of a current pulse of specific value applied to the magnetic coil operating on the phase δ of the quantum bit device.

12. A quantum bit device reinitializing device according to claim 11, characterized in that the first means comprise a second magnetic coil (140) in the vicinity of the quantum bit device and acting on its phase δ and a generator (145) of current pulses of suitable amplitude

to change the transition energy ΔE_{01} temporarily to a value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

13. A quantum bit device reinitializing device according to claim 11, characterized in that the first means comprise a second gate for coupling the Cooper-pair box and a generator of voltage pulses of suitable amplitude to change the transition energy ΔE_{01} temporarily to a value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

14. A quantum bit device reinitializing device according to claim 11, characterized in that the first means comprise a second circuit loop (31) passing through the read Josephson junction (105) and adapted to send into said read Josephson junction (105) a current pulse of suitable amplitude to change the transition energy ΔE_{01} temporarily to a value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak.

15. A quantum bit device reinitializing device according to any one of claims 8 to 14, characterized in that the second means comprise a dissipative device (21) at the terminals of the read Josephson junction (105) and including a dissipative resistor (157), an inductor (158) and a capacitor (159).

16. A quantum bit device reinitializing device according to any one of claims 1 to 7, characterized in that the quantum bit device comprises a physical medium (1) exhibiting quantum behavior and consisting of the energy state of an atom or an ion.

17. A quantum bit device reinitializing device according to claim 16, characterized in that the first means comprise means for varying the probability of the atom or

ion emitting energy.

18. A quantum bit device reinitializing device according to claim 16, characterized in that the means for varying the probability of the atom or ion emitting energy modify the dimensions of the space in which said atom or ion is confined.

19. A quantum bit device reinitializing device according to claim 16, characterized in that the first means comprise a device for moving the atom or ion from a cavity (2) in which it is confined into a much larger cavity (4).

20. A quantum bit device reinitializing device according to any one of claims 1 to 7, characterized in that the quantum bit device comprises a physical medium (11) exhibiting quantum behavior and consisting of a quantum point produced in a two-directional electron gas controlled by gate electrodes (12, 13) over or under the surface of the gas.

21. A quantum bit device reinitializing device according to claims 2 and 20, characterized in that the second means comprise a resonant electrical circuit (16) including a resistive component (161) in the circuit of at least one gate electrode (13) and the first means comprise a magnetic field source (17) or gate voltage sources (14, 15) for applying a specific value of the gate voltage to the gate electrodes (12, 13) in order to vary the size of the quantum point to change the transition energy ΔE_{01} to a value $\Delta E'_{01}$ equal to or close to the value ΔE_{env} of the absorption peak of the electrical circuit controlling at least one of the electrodes (12, 13) defining the geometry of the quantum point.